



# Automotive Injection Molding Part Histories:

## 3 Proven Solutions to Complex Industry Challenges

In the highly competitive automotive industry, OEMs must bring products to market quickly in order to gain an advantage. Many turn to complex injection molders, like Kaysun, for the design and engineering expertise needed to resolve plastic part design and injection molding challenges, comply with industry mandates, innovate custom solutions and gain a critical time advantage in production. Here are three part histories that illustrate the value-add automotive OEMs find in their Kaysun partnerships.

# CASE STUDY 1:

## Sunroof Front Frame

### KEY PROJECT FEATURES: Robotic automation, metal inserts, returnable packaging program, warp control

In transitioning a sunroof front frame for two popular models of a well-known automotive brand from metal to plastic, the OEM faced two significant challenges: a supplier that could not consistently control part warp and a specific requirement regarding “no flash” on insert surfaces.

With a history of successfully addressing warp and the metal-to-plastic conversion of similar parts, Kaysun was awarded the project. Kaysun ultimately agreed to purchase two presses that supported automation and eliminated the risk of flash appearing on the inserts.

#### KAYSUN SOLUTION

Kaysun engineers were instrumental in ensuring the setup of the work cells created production efficiencies and met complex part specifications unique to the sunroof front frame, including:

- Two different robotic installation approaches to bowl feed, stage and load nine metal inserts per part into the tooling
- Automated pre- and post-molding quality assurance checks for insert presence
- Clip features molded in using slides to facilitate the holding of various components (i.e., tubing) assembled by the OEM
- Specialized spring-loaded components designed into the injection mold tooling to comply with “no flash” project requirement

In conjunction with this initiative, a returnable packaging program was implemented to accommodate custom shipping requirements. Kaysun accepts delivery of and exclusively uses the customer’s reusable steel packaging frames to prevent breakage in transit.

#### BUSINESS IMPACT/RESULTS

Transitioning the project from a different injection molder to Kaysun proved pivotal in helping the automotive OEM completely overcome the warp issues that previously hampered production of the sunroof front frame. Further, Kaysun’s depth of design and engineering knowledge, metal-to-plastic conversion experience and introduction of custom automation into the injection molding process provided multiple benefits in successfully lightweighting the component and eliminating the risk of flash appearing on the inserts.



# CASE STUDY 2:

## Belt Tensioning Pulley Assembly

### KEY PROJECT FEATURES: Metal-to-plastic conversion, complex gating, critical roundness specification

Originally constructed from metal with a pressed-in bearing, this belt tensioning pulley assembly was targeted by the OEM for conversion from metal to plastic in order to:

- Reduce vehicle weight
- Maintain low noise level and tight tolerances
- Reduce production costs

#### KAYSUN SOLUTION

By partnering with the OEM team early in the design phase, Kaysun engineers were able to apply design for moldability and scientific molding methodologies which allowed for thorough upfront analysis, data collection and modeling of the design and production processes.

From there, the engineers collaborated on identifying imperfections and making adjustments to the design and mold steel to achieve an “essentially perfect” plastic pulley right out of the mold.

Of particular difficulty was achieving an extremely tight OD roundness specification. To do so:

- Each mold cavity was contoured differently
- 10 gates were created in each cavity to maintain component roundness
- Valve gates closed independently based on pressure transducer reading

Kaysun was also instrumental in reducing production costs. Replacing the pressed-in bearing with one molded into the plastic as an insert eliminated the time and expense associated with secondary assembly.

#### BUSINESS IMPACT/RESULTS

By beginning their working relationship in the design phase, Kaysun engineers were able to help OEM designers and engineers re-strategize their approach to this project. Converting the belt tensioning pulley assembly from metal to plastic significantly lowered the overall production cost while maintaining stringent durability, noise and performance standards for this essential component within a vehicle’s serpentine belt system.



# CASE STUDY 3:

## Heavy Truck Parking Brake Valve Component (Compressed Air)

### KEY PROJECT FEATURES: Design of Experiments, complex material selection process, resolved quality defects from prior vendor

This automotive OEM experienced numerous production setbacks and quality defects due to previous injection molders' inability to achieve a balance between durability and straightness in this heavy truck parking brake valve component. The OEM sought out Kaysun to resolve part design and process engineering challenges and ultimately produce high-quality parts.

#### KAYSUN SOLUTION

To accurately address the interconnected issues posed by the parking brake valve component, Kaysun engineers worked in tandem with the OEM to:

- Collaborate with multiple suppliers to find plastic materials appropriate for the durability and straightness requirements
- Test ~15 different materials to find the best fit
- Build an initial tool to determine gating positioning and prevent component warping
- Run a Design of Experiments (DoE) to determine which differential mold temperatures were required to maintain part straightness
- Improve flow with ring gating and allow for variable part shrinkage via special cuts in the tool

#### BUSINESS IMPACT/RESULTS

Previous injection molders lacked the part design and process engineering expertise necessary to address consistency in the durability and straightness of the parking brake valve component. In collaboration with Kaysun, the automotive OEM was able to identify materials and tooling deficiencies, resulting in incremental improvements to component quality and dimensional consistency that ultimately resolved all outstanding production issues.



From design through production, the contributions of an experienced, full-service injection molder with deep engineering staff can take the products, reputation and business of an automotive OEM to the next level. For more information on these case studies or to discuss your next project, [contact Kaysun today](#).

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